AN EXPLORATION OF THE ACCESS AND CONSUMPTION OF INDIGENOUS VEGETABLES BY HOUSEHOLDS IN RURAL AND INFORMAL SETTLEMENTS IN THE WEST COAST DISTRICT MUNICIPALITY, WESTERN CAPE PROVINCE, SOUTH AFRICA

By

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DECLARATION

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I declare that the above thesis is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references. I further declare that I have not previously submitted this work, or part of it, for any degree or examination in any other higher education institution.

SIGNATURE:_____ **DATE:** 10 January 2019

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DEDICATION

I would like to dedicate this dissertation to my family, my late father, Clyde Ndhlovu, my mother, Sikhanyisiwe Ndhlovu, and my siblings Sandi Ndhlovu, Sane Ndhlovu, Thabi Ndhlovu and Thande Ndhlovu. All of you inspired me. I would also like to dedicate this dissertation to my late aunt Dr Viola Maphosa and to thank her for the guidance she provided in our lives.

ABSTRACT

The consumption of indigenous leafy vegetables is a significant tradition and culture of South Africa. The purpose of this research was to investigate the access and consumption of indigenous leafy vegetables in rural and informal settlements of the West Coast District Municipality (WCDM), Western Cape, South Africa. The research identified ILV being available and accessible in WCDM, methods of preparation used as well as the factors influencing the consumption of ILV. A cross sectional descriptive survey design was used and data collection was done using a structured questionnaire. Respondents were randomly selected from the five local municipalities in the West Coast District Municipality. A total of 205 respondents representing 205 households in the rural and informal settlements of the West Coast District Municipality were interviewed. Majority of respondents were black females, unemployed and had no formal qualification. Seventeen indigenous leafy vegetables were identified in the West Coast District and the majority of the respondents consumed indigenous leafy vegetables as part of their diet mainly because of the health benefits and taste. Four methods of cooking, namely stewing, boiling, steaming and frying were used by the respondents to prepare indigenous leafy vegetables and most of the respondents added additional ingredients during cooking such as mealie meal, fish oil and salt. The informal sector was identified as the major source of indigenous leafy vegetables and cultivation of ILV was very limited. The majority of the respondents consumed ILV at least once a week. Preservation of ILV was not a common practice. Factors such as employment status, higher household size and higher income levels did not influence the frequency of ILV consumption.

Keywords: Indigenous leafy vegetables, rural settlements, informal settlements, consumption, cultivation.

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LIST OF ACRONYMS

ARC – Agriculture Research Council

DAFF – Department of Agriculture Forestry and Fisheries

DEA – Department of Environmental affairs

KZN – Kwazulu-Natal

IV – Indigenous vegetables

ILV – Indigenous leafy vegetables

NRC – National Research Council

SANHANES – The South African National Health and Nutrition Examination Survey

STATS SA – Statistics South Africa

WCDM – West Coast District Municipality

WC – Western Cape

WHO – World Health Organisation

CHAPTER 1: BACKGROUND

1.1 Introduction

The well-known Pedi proverb “meat is a visitor but *morogo* is a daily food” clearly shows the significance of indigenous vegetables in the tradition and culture of South Africa (van Rensburg et al., 2014). The local terms *morogo* (isiPedi) and *imifino* (isiZulu), are used to refer to the different kinds of edible leafy vegetables (Faber et al., 2010). Indigenous vegetables may be defined as plants which are either native to a particular area or plants which were introduced to a particular area long enough to have adopted to the local conditions and are now also referred to as local (van Rensburg et al., 2007). In most rural communities in Africa, indigenous vegetables are grown in home gardens, subsistence farms and others are still collected from the wild (Faber et al., 2010). In Kenya indigenous vegetables species such as amaranth, spider plant, cowpeas, jute and nightshade are cultivated by inhabitants in the rural and peri-urban areas. These indigenous vegetables either grow as weeds among other vegetable plants or are cultivated alongside other cereal base crops such as the maize plant (Chelang et al., 2013). In semi-arid countries such as Botswana with very low annual rainfall, more than one hundred and fifty different indigenous vegetable species are used by rural communities regularly, and even more so during hunger seasons. Indigenous vegetables such as Amaranths and Cleome can grow naturally in the wild, in arable croplands and in the backyard of rural homes (Mojeremane et al., 2011). The cultivation of indigenous vegetables can be more sustainable and profitable considering that these vegetables have shorter growing life-cycles, are less affected by environmental factors such as drought, and require less fertiliser inputs and growing space (Afari-Sefa et al., 2012). These attributes allow indigenous vegetables to have a positive contribution to food security in the arid and semi-arid regions of South Africa (Pitso & Lebese, 2014). Indigenous vegetables are versatile and can be found growing in farms, fields, among plantations (van der Hoeven et al., 2013) and the wild (Faber et al., 2010).

Traditionally prepared African vegetables dishes have been found to be acceptable to children, hence these vegetables can be used for improving the nutrition of children in rural communities (van der Hoeven et al., 2013). Some indigenous vegetables such as cowpeas and amaranth leaves are mainly eaten as a relish that often accompanies starch-base staple dishes (Muvengahama et al., 2013). Cowpea leaves are often boiled, squeezed and rolled into small round pellets and sun dried to preserve for future use. The dried vegetables can later be cooked in liquid such as milk and spices to make relish (Dube & Fanadzo, 2013). The nutritional aspects of indigenous vegetables have a fundamental role in maintaining a balanced diet and reducing micronutrient malnutrition (Bvenura & Sivakumar, 2017). Indigenous vegetables are a good source of protein and minerals such as iron, calcium, phosphorus and magnesium as well as Vitamin A (Pretorius & Schonfeldt, 2011; van Jaarsveld et al., 2014). The consumption of indigenous vegetables can contribute in combating micronutrient malnutrition which often results from lack of micronutrients such as beta carotene, zinc and iron (Muvengahama et al., 2013). An average cooked portion size (130g) of indigenous leafy vegetables can provide up to 10% of the RDA for protein, zinc, thiamine, riboflavin, and Vitamin C for individuals who are 19 to 30 years old. Furthermore, cowpea and pigweed leaves have been found to be a good source of calcium and magnesium, providing more than 10% of the RDA (van Jaarsveld et al., 2014). The practice of mixing different indigenous vegetables is highly recommended as it contributes different benefits of a healthy diet (Neugart et al., 2017).

The rate of consumption and diversity of indigenous vegetables has reduced in many sub-Saharan regions in Africa (Afari-Sefa et al., 2012). This reduction is due to population increase, erosion, and overgrazing (Hart, 2011). Exotic vegetable species introduced during colonial times have led to dietary changes and less consumption of indigenous vegetables in many rural communities (Muvengahama et al., 2013; Muhanji et al., 2011). Furthermore, a change in people's perception of indigenous vegetables, such as associating them with poverty, has also

resulted in reduced consumption (Faber et al., 2010). The new generations of adults in rural communities do not prefer indigenous vegetables and as such are not often included in their diet (Dweba & Mearns, 2011). Indigenous vegetables can contribute to food security and a dietary diversity of rural communities in developing countries. In times of scarcity, preserved indigenous vegetables help to ensure availability when required (Maroyi, 2011). In rural communities, low-income households often rely more on indigenous vegetables as a regular source of food, especially during hunger season (Hart, 2011; Muvengahama et al., 2013; Shumsky et al., 2014; Gido et al., 2017). Unlike rural communities, urban households rely on informal markets to access indigenous vegetables; hence the trading of indigenous vegetables can be commercialized, thereby improving income generation in rural communities (Faber & Oeles, 2010).

1.2 The research problem

Problems affecting the access and consumption of indigenous vegetables in rural and informal settlements in developing countries are related to a decline in cultivation and consumption (Sasson, 2015). Malnutrition and starvation in rural communities has been exacerbated by the decline in consumption of indigenous vegetables. This is because younger generations in rural communities have negative perceptions of indigenous vegetables and this has negatively affected preference and consumption of these vegetables by the youths (Hart, 2011). Similarly, the preferences of exotic vegetables over indigenous vegetables and the association of indigenous vegetable with poverty has also contributed the decline in the consumption of indigenous vegetables in some rural communities in the Eastern Cape Province, South Africa (Dweba & Mearns, 2011). Furthermore, the urbanisation of many rural communities has resulted in reduced knowledge and usage of indigenous vegetables (van der Hoeven et al., 2013). This has also favoured the consumption of exotic vegetables at the expense of the indigenous vegetables (van Rensburg et al., 2007). Under-cultivation of indigenous vegetable

has resulted to insufficient supply of indigenous vegetables especially in hunger seasons when vegetables are scarce (Hart, 2011). This affects the rural households in which indigenous vegetable constitute part of their diets (Chelang et al., 2013; Gido et al., 2017). Unlike in South Africa, the commercialization of indigenous vegetables has been successful in many other African countries such as in Kenya where the introduction of indigenous species in retail markets has resulted in increased high demand and increase sales (Chelang et al., 2013).

1.3 Motivation for the study

Currently there is limited information on the access and consumption of indigenous vegetables by households in the rural and informal settlements in South Africa. This study will look into access to available indigenous vegetable and their consumption pattern in these rural communities. Information from this study will be used by different stakeholders to improve on the cultivation and consumption of these by households in rural communities, especially in the West Coast District Municipality, Western Cape Province, South Africa.

1.4. The aim and objectives of the study

1.4.1 Aim

The aim of the study is to investigate access and consumption of indigenous vegetables by households in the rural and informal settlements of households in the rural and informal settlements in the West Coast District Municipality, Western Cape Province.

1.4.2 Objectives

1. To investigate the availability and access to indigenous vegetables by households in the rural and informal settlements.

2. To investigate the preparation and consumption of indigenous vegetables by households in the rural and informal settlements.

3. To investigate factors that influence the consumption of indigenous vegetables by households in the rural and informal settlements.

1.4.3 Research questions

1. Which indigenous vegetables are available and accessible to communities?

2. What is the main reason behind the consumption of indigenous vegetables by communities?

3. What are the factors that influence the consumption of indigenous vegetables?

1.6. Layout of the Dissertation

This study has six chapters, which are arranged as follows:

Chapter 1: This first chapter is the introduction to the study; it provides an overview of the study and provides background material. This section also outlines the problem statement, the purpose of the study, the aim and objectives of this study and explains the layout of the dissertation. Chapter 2: This chapter provides a literature review of current and existing literature on indigenous vegetables. It details information on consumption, method of preparation, nutritional value and factors affecting the consumption of indigenous vegetables. It also described the methods of cultivation and preparation of dishes as well as the commercialization of indigenous vegetables. It also defines the different type of settlements in South Africa. Chapter 3: This chapter outlines the research area, data collections and the research instruments that were used. The limitations to the research are briefly discussed here. Chapter 4: This chapter outlines the research findings emanating from the research survey in the West Coast District Municipality from the respondents. Chapter 5: This chapter provides a comprehensive discussion of the results on the socio-demographic information of respondents, preparation, preservation, consumption and cultivation. Chapter 6: This chapter, conclusions and recommendations for improvements are provided. A list of references then follows.

1.7. Research Conceptual Framework

Different factors such as awareness, cultivation, and retailing can influence the availability and access to indigenous vegetables to households (Figure 1). Awareness can lead to an increase in interest and demand for indigenous vegetables. Raising awareness of the health benefits associated with consumption of indigenous vegetables through education and social media increases acceptability and interest of indigenous vegetables among household communities in the rural and informal settlements. This in turn promotes the inclusion of indigenous vegetables in diet (Bvenura & Sivakumar, 2017). The consumption of indigenous vegetable can be affected by urbanization, preference, access and availability. Urbanization introduces westernized values which associate the consumption of indigenous vegetables with poverty and past way of living; these negative perceptions consequently lead to the decreased usage of these vegetables as exotic vegetables which favour the modern way of living and are more preferred in urbanized communities (van der Hoevan et al., 2013; Dweba & Mearns, 2011; Hart, 2011). The cultivation of indigenous vegetables by households can boost consumption as well as income generation through trade. It is worth noting that the consumption of indigenous vegetables is associated with higher dietary diversity and better micronutrients (Boedecker et al 2014). Higher diversity on indigenous vegetables in retail outlets increases consumption as indigenous vegetables will be more accessible. Retailing of indigenous vegetables has economic benefits (Barirega et al., 2012) and can lead to poverty alleviation through income generation (Oladele et al., 2011). The selling of indigenous vegetables can boost income generation in poor rural settlements and may lead to an increased consumption of these vegetables in urban settlements (Mojeremane et al., 2011).

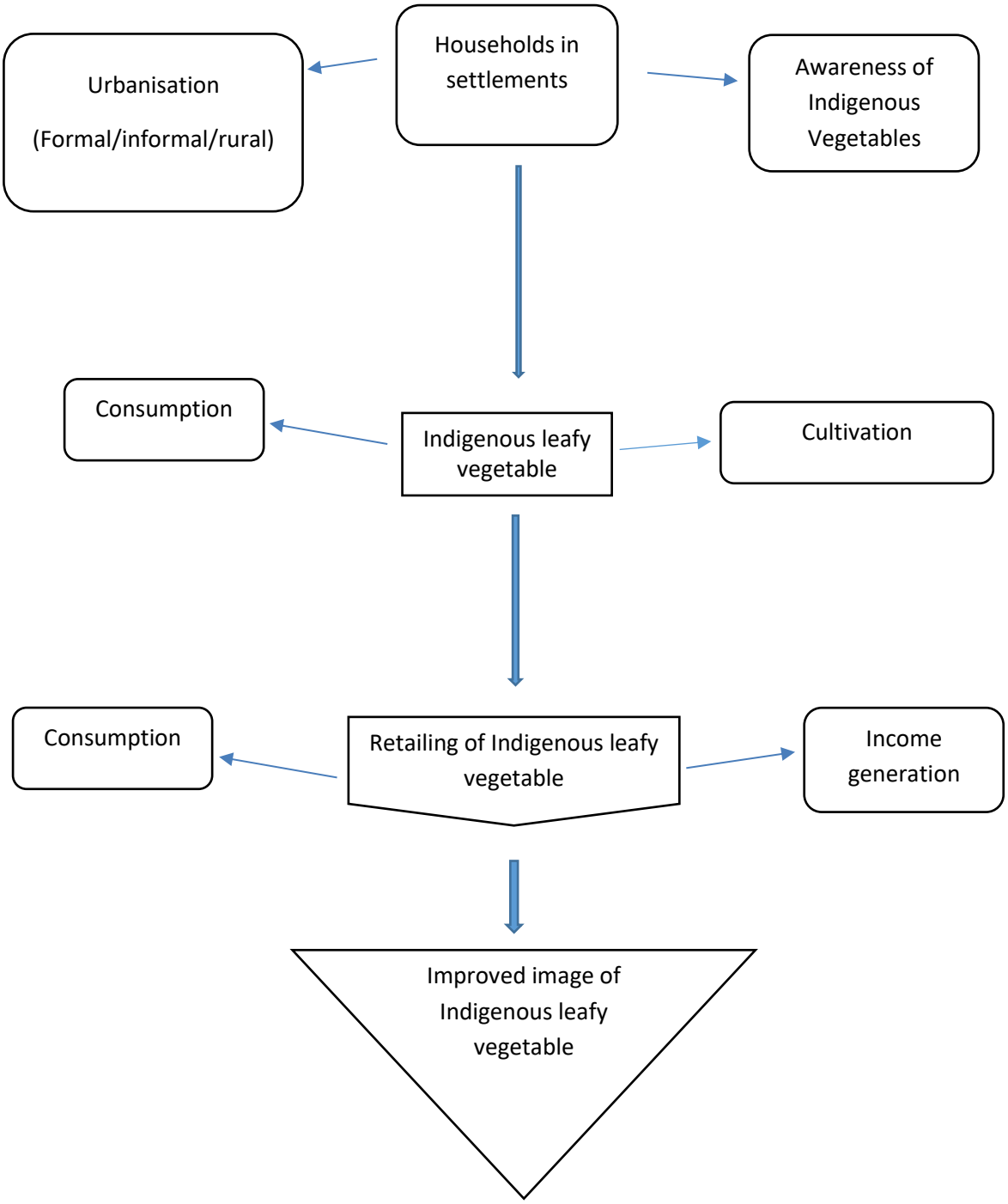

Figure 1 A conceptual framework showing the influence on the contribution of indigenous vegetables to rural/informal house income generation

CHAPTER 2: LITERATURE REVIEW

2.1. The consumption of indigenous vegetables

Several studies have shown that indigenous vegetables are good sources of protein, Vitamin A, zinc, iron, magnesium and calcium and can reduce Vitamin A deficiency in children (Afari-Sefa et al., 2012). The consumption of indigenous vegetables can provide people living in rural communities with healthy components such as antioxidants which can reduce the risk of life style diseases such as cardiovascular diseases and diabetes (Taleni et al., 2012). Studies in Zimbabwe showed that the pumpkin leaves are the most preferred vegetable, consumed three to four times in a week during the rainy season (Maroyi, 2011). One hundred and fifty edible wild and semi-wild species were reported used by rural communities in Botswana all the time or during famine (Mojeremane et al., 2011). Amaranth, jute and Ethiopian mustard are among the most consumed species in Malawi and Mozambique (Chagomoka et al., 2013). Kenya has more than two hundred and ten species of indigenous vegetables which are part of the traditional diets. These include African nightshade, spider plant, cowpeas, jute and pumpkin (Chelang et al., 2013).

2.3. Methods of preparation and preservation of indigenous vegetables

Indigenous vegetables can either be prepared by boiling, steaming and frying and, if cooking is not properly executed, it can lead to the loss of some water-soluble vitamins (van Rensburg et al., 2007). Certain species of indigenous vegetables such as spider plant have a bitter flavour, thus boiling in a large amount of water and discarding the water used for boiling two or three times renders these vegetables palatable (van der Hoeven et al., 2013). Additional ingredients such as oil, onions, tomatoes and curry powder can be added to improve the taste of indigenous vegetables (Faber et al., 2010). Mixing of several indigenous species in one cooking vessel is a common cooking practice (Muvengahama et al., 2013). Indigenous vegetables generally

require long cooking times compared to exotic vegetables (Boedecker et al., 2014). This is because certain types of vegetables have a bitter taste; hence they are boiled longer in an attempt to remove bitterness (van der Hoeven et al., 2013). The mixture of petioles and leaves during cooking also requires more cooking water and cooking time (Pretorius & Schonfeldt, 2011).

2.4. Dishes of indigenous vegetables

Indigenous vegetables are common in the sub-Saharan region as well as the whole of Africa, and most of them are made into a relish or snack which accompanies starchy dishes such as maize porridge, potatoes, rice and many other starchy grains and tubers (Muvengahama et al., 2013).

In Zimbabwe, indigenous vegetables are also used to prepare snack dishes such as *umxhanxa*, a dish made by boiling the fleshy parts of sweet melon *(Citrullus lonatus*) with corn, the leaves of this plant can be boiled and served as a relish (Taleni et al., 2012). In Zambia, cowpeas are prepared by boiling them till tender; peanut butter and seasoning are added to make a dish called *chibwaba*. *Imifino* is a popular dish in South Africa made by boiling shredded cowpea leaves and frying them in onion then stirring the mix into a thick maize-meal porridge (Dube & Fanadzo, 2013). In the Mediterranean region a traditional goulash is made by mixing many indigenous species in one pot with dry meat, potatoes, and rice; this mixture is allowed to boil together for some time (Łuczaj & Dolina, 2015). In Madagascar, *lacta* is a dish prepared frying onion, tomato then adding a mix of leafy vegetables and small amount of meat then boiled together (Taleni et al., 2012).

2.5. Nutritional value of indigenous vegetables

Vegetables are a good source of micronutrients, fibre, and vitamins (Afari-Sefa et al., 2012). Traditional African vegetables such as amaranth, cowpea leaves and pods, African nightshade spider plant, African eggplant and moringa – are rich in micronutrients, antioxidants and other health-related phytochemicals. A study in Kenya showed that indigenous vegetables consumers have significantly higher copper intakes compared to non-indigenous vegetable consumers and the consumption of indigenous vegetables is associated with higher dietary diversity and better micronutrient intake for people in rural communities (Boedecker et al., 2014). Cowpea and pigweed leaves have been found to be a good source of calcium and magnesium, providing more than 10% of the RDA (van Jaarsveld et al., 2014). Table 2.1 shows a comparison of mineral and vitamin composition for cooked indigenous (amaranth, cowpea, jute) and exotic vegetables (spinach and cabbage). According to Table 2.1 below, indigenous vegetables, namely amaranth and jute, show a high content of calcium, zinc, phosphorus and potassium after cooking as compared to spinach, cabbage and okra. Cabbage, an exotic vegetable, indicates the least amount of vitamins and minerals when cooked, whereas spinach has a high content of iron, sodium and Vitamin B6. Cowpea leaves contain the highest thiamin and niacin content. Indigenous vegetables generally show a high content of minerals and vitamins as compared to the exotic vegetables.

2.6. Contribution of indigenous vegetables to household food security

A household is considered to be food secure when all its members do not live in hunger or fear of starvation (Modirwa & Oladele, 2012). Conversely, a household is food insecure when the amount of money it spends on food is not enough to purchase a basic diet that is nutritionally adequate (Cock et al., 2015). Indigenous vegetables have been found to address the need of household food insecurity, as they are perceived to be nutritious and available at a lower cost.

Furthermore, they are relatively easier to prepare and can be available during periods of drought and low rainfall (Muhanji et al., 2011). Indigenous vegetables have been found to contribute to the annual food supplies of many poor households in rural communities. Most rural households in KwaZulu-Natal Province in South Africa have been found to consume indigenous vegetables once a day compared to twice a day for those in the Limpopo Province of South Africa (Faber et al., 2010).

Table 2.1 Vitamin and mineral content of 100g cooked portions of indigenous vegetables in comparison with other exotic vegetables

Nutrients	**unit**	**Amaranths**	**Cabbage**	**Cowpea Leaves**	**Jute**	**Spinach**	**Okra**
Calcium	**mg/100g**	209	48	69	211	136	77
Iron	**mg/100g**	2.26	0.17	1.09	3.14	3.57	0.28
Magnesium	**mg/100g**	55	15	62	62	87	36
Phosphorus	**mg/100g**	72	33	42	72	56	32
Potassium	**mg/100g**	641	196	351	550	466	135
Sodium	**mg/100g**	257	8	242	247	306	241
Zinc	**mg/100g**	0.88	0.20	0.24	0.79	0.76	0.43
Vit C	**mg/100g**	41.1	37.5	18.4	33.0	9.8	16.3
Thiamin	**mg/100g**	0.020	0.061	0.256	0.091	0.095	0.132
Riboflavin	**mg/100g**	0.134	0.038	0.142	0.192	0.236	0.055
Folate	**µg/100g**	57	30	60	104	146	46
Niacin	**µg/100g**	0.559	0.248	1.008	0.890	0.490	0.871
Vit A *RAE*	**µg/100g**	139	4	29	259	524	14
Vit B6	**µg/100g**	0.177	0.112	0.135	0.570	0.242	0.187

Adopted from USDA, report date June 05, 2015

2.7. Factors affecting the consumption of indigenous leafy vegetables

However, despite a significant and regular consumption of indigenous vegetables, many households in rural communities often experience food shortages at some time during the year, and this has been attributed to unavailability, as many households do not cultivate these vegetables (Muvengahama et al., 2013).

2.7.1. Urbanization

It is evident that urbanisation has resulted in reduced knowledge and usage of indigenous vegetables (van der Hoeven et al., 2013). Urbanisation introduces new values and attitudes, which are mainly westernised at the expense of the cultural norms (Shava, 2000) cited in (Dweba and Mearns, 2011). The young people and the urbanised tend to associate the consumption of indigenous vegetables with poverty and the past, not the modern way of living. Urbanisation therefore favours the consumption of the western vegetables at the expense of the indigenous vegetables (van Rensburg et al., 2007). As the younger generation have negative perceptions of indigenous vegetables, this could negatively affect the usage of these vegetables in the coming generations (Hart, 2011). However, in Kenya, a study conducted in Eldoret town showed that there is an increase in the demand of indigenous vegetables in urban areas, resulting in more vegetables being sold in retail shops (Chelang et al., 2013).

2.7.2. Preferences for exotic vegetables

Despite the existence of many indigenous leafy vegetable species in South Africa, many people in rural communities do not consume all the available varieties. People tend to discriminate between varieties based on cultural beliefs and sensory perceptions such as leaf size, hairiness on leaves and bitterness (Muvengahama et al., 2013). The most commonly consumed vegetable in Limpopo Province was found to be wild melon and amaranth leaves, whereas in the KZN area, amaranth was the most preferred (Vorster, 2007). In Botswana, it was shown that markets

favour exotic vegetables over the indigenous since they are well researched and developed (Mojeremane et al., 2011). For cultivation purposes, in Limpopo preference was first given to plant species that provide more than one food stuff in their life-cycle, such as cowpeas and pumpkin (Hart, 2011).

2.7.3. Availability and access

Availability and accessibility are major factors contributing to the reduced consumption of indigenous vegetables. People in the rural areas have free access to indigenous vegetables as they are collected from the wild, in farms and in plantations (Faber et al., 2010). However, people can be reluctant to walk long distances to gather these vegetables from the wild, thus contributing to a reduced use of indigenous vegetables (Dweba & Mearns, 2011). Seasonal availability of most indigenous vegetables leads to a reduced frequency of consumption as these vegetables are not available, particularly in drought periods (van der Hoeven et al., 2013). Indigenous vegetables are less available in urban and peri-urban areas; thus urban residents have to purchase vegetables from informal markets, which also sell at expensive prices during the dry season (Oladele et al., 2011). The cultivation of indigenous vegetables provides a reliable access to these vegetable; however, a study conducted in the Manhlanteni community indicated that of the thirty-three species available in the area, 77% of the respondents cultivated only one or two species; thus more people are dependent on naturally growing indigenous vegetables, which can be less reliable. The availability of indigenous vegetables is also dependant on the contribution of the vegetable in food intake; in Oyo state in Nigeria mushrooms are most available due to their contribution in diet as a soup or fruit (Oladele et al., 2011).

2.8. Methods of cultivation

The cultivation of indigenous vegetables is a common practice; however, not all species are being cultivated. These vegetables are mostly grown as intercrops with other vegetables or staples in home gardens and there has been hardly any production on a large scale (Dweba & Mearns, 2011). The cultivation of indigenous vegetables in home gardens is a common practice in South Africa (Hart, 2011). A survey conducted in Limpopo Province showed that most indigenous vegetables were naturally occurring in the household plots; however these crops were nurtured by allowing them to grow after germination (Hart, 2011). Selective weeding is practiced in these plots, that is when indigenous species, mainly the ones treated as food, are treated as crops and allowed to grow without disturbance (Taleni et al., 2012). There is often no precise spacing of seeds during cultivation, and wood ash is used to control pests (Chelang et al., 2013). Indigenous species generally require less inputs for cultivation than the exotic species (Muhanji et al., 2015).

Naturally, indigenous vegetables rely exclusively on rainfall; however a few species such as okra may require watering in the initial two months (Shrestha, 2013). In South Africa, indigenous vegetables are available in the summer season which is characterized by high rainfall and warm temperatures (November to April), availability gradually declines in May and species become scarce in winter (June, July) until spring when growth resumes. Availability gradually increases from August to October (Modirwa & Oladele, 2012). In some parts of KZN province, cultivation is limited due to steep slopes and shallow soil, which cannot support the growth of plant species. Generally, plants are allowed to flower and produce seed; these seeds are dried and stored in plastic or bottles until planted in the next summer (Faber et al., 2010). The use of non-certified seeds is a common practice among women; however the practice is not commercially viable and poor seed quality is one of the major constraints to

production (Chelang et al., 2013). Indigenous species such as amaranth are tolerant of adverse climatic conditions but prolonged seasons of drought may lead to reduced leaf yields. Species, such as African eggplant, have the ability to resist mould, mildew and other soil pathogens, while spider plant is susceptible to various pests such as locusts and worms. Leguminous plants such as cowpeas are beneficial for adding nutrients to the soil through nitrogen fixation process (Taleni et al., 2012).

In the Limpopo province, research conducted in Molati village indicated that cultivated indigenous vegetables were essential foodstuff in the people's diet. Consumption of indigenous vegetables was more frequent particularly during midday and evening meals as compared to meat (Hart, 2011). Cultivation of indigenous vegetables provides a reliable access to these vegetables, particularly during the dry season as poor households are able to produce for home consumption as well as enough vegetables to preserve and cover the dry season. This in turn increases frequency of consumption during this season (Hart, 2011). Poor production systems, such as a lack of seed, poor soil fertility, and poor weather conditions, were cited as contributing factors to reduced availability, consequently leading to reduced consumption of indigenous vegetables in a study conducted in the Autherstone and Mars area, KwaZulu-Natal Province (Vorster, 2007). The practice of intercropping, which is widely used in most households, may contribute to low yields of both the cultivated grain and cow peas in drought seasons, thus contributing to low productivity and a reduced availability and consumption of cowpeas. The use of farm retained seeds, which are not certified, may contribute to less production as these seeds are sometimes damaged and diseased and which in turn affects the germination of the plants (Dube & Fanadzo, 2013).

2.9. Commercialization of indigenous vegetables

The commercialization of indigenous vegetables can result in economic benefits to rural communities and individuals involved in the trade (Barirega et al., 2012). Despite the commercial potential of indigenous vegetables, the quantity of indigenous vegetable sold in formal markets is much lower than in informal markets (Mojeremane et al., 2011). However, some indigenous crops have been successfully commercialized in many countries. For instance, the South African indigenous tea, rooibos, represents a success story in the commercialization and marketing of indigenous products. Rooibos tea has been widely used in both the food and cosmetic industries. It is currently being used as an ingredient in cosmetics and slimming products, as a food colorant and as flavouring for baking, cooking and cocktail making (Wyk, 2011). Marula is most famous in South Africa for the commercially produced Amarula Creamy Liqueur. In South Africa alone, five hundred tons of morula fruits are processed for fruit juice and two thousand tons processed for the Amarula liqueur, and this has led to income generating opportunities for the poor in many rural communities (Cock et al., 2011). Besides economic benefits, the commercialization of indigenous vegetables will also help to conserve these species and prevent extinction (Shrestha, 2013). The increase in income to traders helps to alleviate poverty and improve the standards of living (Oladele et al., 2011).

2.10. Types of Settlements in South Africa

Most of the South African poor communities occupy mainly the informal and rural settlements. Both settlements are characterized by poverty and high levels of food insecurities.

2.9.1 Urban settlements

The South African population is more than sixty percent urbanized; that is, almost half of the South African population live in urban areas. A quarter of the urban dwellers reside in the informal settlements (Massey, 2014). Urban areas are characterized by a high cost of living

and limited economic opportunities. Rural to urban migration has led to poverty now shifting from rural areas to the urban areas. Formal and informal housing, for both the urban food secure and urban poor respectively, form part of the urban housing structure. (Battersby, 2011).

2.9.2. Informal settlements

Statistics South Africa defines informal settlements as unplanned settlements on land which has not been surveyed or proclaimed as residential. These settlements are characterized by informal dwellings known as shacks (Western Cape Informal Settlements Status, 2013). The 2009 National Housing Codes Informal Settlement Upgrading Program identifies informal settlements as characterized by lands which are unsuitable for settlement due to topological features such as unstable soils, wetlands and flood risk, associated with high population densities and also backlog in service delivery (Western Cape Informal Settlements Status, 2013). Poverty is highly associated with these informal settlements (Victor, 2014). A study conducted in a Cape Town's informal settlement showed that many of the persons under survey were undernourished, with approximately twenty-five percent of the families consuming only one or two meals in a day. Most of the residents were cash poor (Govender et al., 2011).

2.9.3. Rural settlements

Rural settlements are characterized by poor low-income communities which are reliant on agriculture. A rural area is usually defined as an area where settlements are sparse and primarily depended on agriculture, herding and tourism. The Rural Development Strategy states that rural settlements are those areas with the lowest level of service and the greatest distance to the nearest service points. They include large-scale farming areas, small municipalities and some peri-urban squatter camps. Rural settlements surveyed in Limpopo Province showed that fifty-three percent of the rural homes declared themselves to be severely food insecure, social grants are the main source of income, and farming income contributes less income (Cock et al., 2015).

A lack of employment opportunities and shortages of arable and grazing land has immensely contributed to poverty in rural areas. Agriculture now contributes very little to income, even for households that maximize the use of their land (Pereira et al., 2014).

CHAPTER 3: RESEARCH METHODOLOGY

3.1. Study area

Figure 2. Map of West Coast Municipality (source: West Coast District Municipality, South Africa)

The West Coast District Municipality is a historically fishing and agricultural region located in the Western Cape Province of South Africa and comprises five local municipalities, namely Saldanha Bay, Bergrivier, Swartland, Matzikama and Cederberg (West Coast District Municipality, 2014). According to the WCDM Social Economic Profile (2016), the population of the West Coast is estimated to be 427 742 by 2017, with a strong concentration in the young age groups of between 25 to 37 years. There has been an increase in the number of households. As per the 2016 community survey, the number of households is estimated to be 129 862 as compared to Census 2011, which showed 106 781 households. The WCDM also records the increase in the poverty percentage as 2.6% of the 2016 population which is in poverty compared to the 2.0% of the population in 2011. In addition, approximately 51.4% of the households in the WCDM fall within the poor to low income group, which ranges between 0 (no income) to R4 166 per month (WCDM Social Economic Profile, 2016).

3.2. Research Design

A cross-sectional descriptive survey research design was used to collect data. A descriptive approach has been followed considering that data was collected without manipulation of any variables or factors.

3.3. Data collection instrument

The data collection instrument was in the form of a questionnaire which consisted of four sections: Section 1: data collection on the socio-bio graphics of respondent including their settlement type; Section 2: data collection to determine the availability and access to indigenous vegetables by communities; Section 3: data collection to determine the mode of preparation,

consumption and preservation of indigenous vegetables, and Section 4: data collection to investigate the cultivation and contribution of indigenous vegetable to household income.

3.4. Sampling of respondents

Respondents were sampled from all the five local municipalities in the West Coast District Municipality. Each local municipality was divided into areas of informal and rural settlements. Respondents were randomly samples from informal settlement areas and rural settlements areas of the five local municipalities in the West Coast District Municipality. Respondents (individual who contribute to household income) were randomly sampled from a list of households from randomly selected informal and rural settlement area in five different local municipality. A total of 205 respondents, representing 205 households in the informal and rural settlement areas, from all the five local municipalities in the West Coast District Municipality, were interviewed.

3.5. Data Collection

Before data collection, permission to conduct study was requested from the West Coast District Municipality by the principal researcher. Data collection was done by means of an interview. The questionnaire was administered through face-to-face interviews, the researcher recorded data captured and also took notes of additional responses probed by open-ended questions. The principal researcher interviewed respondents at their homes. An interpreter for Xhosa was available when required. Data collection was done during daytime (10 am to 4 pm).

3.6. Data analysis

The descriptive statistic was conducted for all variables with data points using the statistical package for the social sciences (SPSS version 19) with a Windows application. ANOVA (Analysis of Variance) was used in the analysis variation between the responses of respondent

within different socio-demographics groups. The effect of ethnicity, employment type, average monthly income, and household size on the consumption of indigenous vegetable was predicted using binary logistic regression.

3.7. Establishment of Validity and Reliability

Questionnaires were piloted by the researcher prior to the survey to ensure validity and reliability. The pilot study consisted of 20 respondents selected randomly from different households. Content validity was ensured by a panel of experts with experience in indigenous vegetables who examined questionnaires using information from previous publication to ascertain instrument validity for the intended purpose and that the instrument is appropriate for measuring what it is supposed to measure. Reliability and internal consistency of the questionnaire was determined during the pilot study using the Cronbach's alpha coefficient. The higher the score the more reliable and consistent is the instrument. Data collected from the pilot study was not used in the final study.

3.8. Ethical Considerations

Permission to conduct the study was obtained from the West Coast District Municipality. Ethical clearance was conducted from the College of Agriculture and Environmental Sciences at the University of South Africa. Respondents were advised on the nature of the study being conducted and given a choice of either participation or non-participation. Participants, who must be older than 18 years, were requested to complete a consent form that describes the nature of the research. Respondents were able to withdraw from the study at any time.

CHAPTER 4: RESULTS

4.1 Socio-demographic details of respondents

The majority of respondents were females (69.8%), were 35 years or younger (64.3%) and were mostly blacks (90, 7%). Only a few of the respondents were coloured (8.8%) while the rest white (0.5%). The majority of the respondents were single (54.6%), while up to 41.4% of them were married or living with a partner, and 3.9 were separated or widowed. Regarding the source of income, most of the respondents (45.4%) were unemployed compared to only 30.2% who had formal employment. The rest are either in casual labour (12.7%), pensioners (3.9%), self-employed (3.9%), farming (1.5%) and other activities (2.4%). The huge majority of respondents (61%) had an average monthly income of below R1000, while 20.5% had an average monthly income ranging from R1000 to R2999. In terms of their highest education level qualifications, the majority of respondents (76.1%) indicated that they have no formal qualification, while only a few of them (20%) had obtained a matric certification (high school certificate) and the rest (4.9 %) had a higher education diploma, certificate or a degree (Table 4.1).

The majority of respondents were based in Saldanha Bay (38%), Swartland (37.1%) and Cederberg (14.1%) municipalities while the rest were based in Matzikama (7.8%) and the Bergrivier (2.9%) municipality. Most of the households (73 %) were located in an informal settlement and the rest of them (23.2%) were located in rural settlements. In terms of longevity of stay in the research area, the majority of the respondents have lived in the area for more than three years (63.4%), while 16.1% said they have lived there for more than one year and 20.5% said they have lived there for either one year or less. The majority of respondents (61.9%) had more than three people living in their individual households. The majority of respondents'

household head was the father (54.6%), while the rest of them were headed by a mother (23.4%) or other relatives (22%) (Table 4.2).

Table 4.1: Biographic information of respondents (N=205)

Variables		Frequency (%)
Gender	Male	62(30.2)
	Female	143(69.8)
Age group	18 – 25 years	29(14.1)
	25 – 35 years	103(50.2)
	36 – 45 years	49(23.9)
	46 – 75 years	24(11.7)
Ethnicity	Black	186(90.7)
	Coloured	19(9.3)
Marital status	Married by law	32(15.6)
	Traditional marriage	38(18.5)
	Living together	15(7.3)
	Separated	3(1.5)
	Widowed	5(2.4)
	Single	112(54.6)
5 Type of employment	Pensioner	8(3.9)
	Formal employment	62(30.2)
	Self employment	8(3.9)
	Farming	3(1.5)
	Casual labour	26(12.7)
	Unemployed	93(45.4)
	Other	5(2.4)
6 Average monthly income	Below R1000	125(61)
	R1000 – R2999	41(20.5)
	Above R3000	37(18.5)
7 Highest education level	No formal education	156(76.1)
	Matric certificate	41(20)
	Post-matric qualification	8(3.9)

Table 4.2: House size and residential details of respondents (N=205)

Variables		Frequencies
In which of the following municipalities do you live in now?	Saldanha Bay	78(38)
	Bergrivier	6(2.9)
	Swartland	76(37.1)
	Matzikana	16(7.8)
	Cederberg	29(14.1)
In which of the following settlements is your household located?	Rural settlement	54(26.3)
	Informal settlement	151(73.7)
How long have you lived in this area?	Less than a year	27(13.2)
	One year	15(7.3)
	More than one year	33(16.1)
	More than three years	130(63.4)
Size of your household, i.e. the number of people including yourself who live in your house/dwelling for at least three months of the year?	Live alone	34(16.6)
	2	44(21.5)
	3	47(22.9)
	4	34(16.6)
	5	20(9.8)
	More than 5	26(12.7)
Children	1	49(40.8)
	2	34(28.3)
	3	18(15)
	4	11(9.2)
	More than 5	8(6.6)
Who is the head of the household?	Father	112(54.6)
	Mother	48(23.4)
	Grandfather	1(0.5)
	Grandmother	0(0)
	Uncle	0(0)
	Aunt	2(1)
	Other relatives	45(22)

4.2 Access to and reason for the consumption of ILV

Respondents had access to all the seventeen ILV listed. However, the most-accessed leafy vegetables were those of sweet potato (82.4%), melons (80.5%), pumpkin (77.6%) and cowpeas (46.3%) crops respectively. Other crops whose leafy vegetables were accessed by up to 25% of the respondents were common sow thistle (33.2%), pigeon peas (31.7%), common labsquarter (30.7%), amaranth (30.2%), Chinese cabbage (26.8%) and Ethiopian mustard (25.4%). The rest of the other crops leafy vegetables were accessed by less than 25% of the respondents (Table 4.3).

The vast majority of respondents (92.6%) indicated that they consume ILV and the reasons put forward by most of them are: ILV possess many health benefits (49.3%) and that taste of ILV is liked by the respondents (37.1%). Only 5.9% and 8.3% of respondents indicated they consume ILV because they are cheap or readily available in the wild respectively. According to 50% (54%) of the respondents the availability of ILV in their area has increased over the years. Most of respondents indicated they buy ILV from informal markets (80.5%) and the retail shops (56.6%). Only a few of them indicated they get ILV from a home garden/yard (9.8%), community garden (1.5%) or fields/in the wild (27.3%). ILV are fairly available throughout the year to huge number of respondents (Table 4.4).

Table 4.3 The accessibility of indigenous leafy vegetable crops to respondents (N=205)

Crops	Frequency
Amaranth	62(30.2)
Chinese cabbage	55(26.8)
Cow peas	95(46.3)
Pumpkin	159(77.6)
Melons	165(80.5)

Blackjack	25(12.2)
Spider plant	15(7.3)
Jews mallow	10(4.9)
Nightshade	39(19)
Sweet potato	169(82.4)
Common labsquarter	63(30.7)
Common sow thistle	68(33.2)
Ethiopian mustard	52(25.4)
Cassava	16(7.8)
Cocoyam	20(9.8)
Purslane	23(11.2)
Pegion peas	65(31.7)
I do not know them	5(2.4)
Other	0(0)

Table 4.4 The consumption and availability of indigenous leafy vegetables by respondents (N=205)

Variables		**Frequency**
Do you eat indigenous vegetables?	Yes	187(92.6)
	No	15(7.4)
If no, why?	I do not like them	6(2.9)
	They are not available in the wild	5(2.4)
	I do not know how to cook them	0(0)
	I do not know what they are	2(1)
	Other	2(1)
Why do you eat indigenous vegetables?	I like the taste	76(37.1)
	They are cheap	12(5.9)

	They have many health benefits	101(49.3)
	They are easily available	17(8.3)
	Other	30(14.6)
Has the availability of indigenous vegetables increased or decreased in your area?	Increased	101(54)
	Decreased	86(46)
Where you get the indigenous leafy vegetables?	Buy from informal market	165(80.5)
	Buy from retail shop	116(56.6)
	From home garden/yard	20(9.8)
	From community garden	3(1.5)
	From planting fields/plantations	50(24.4)
	From the wild	69(2.9)
In which months do you get fresh indigenous vegetables?	January	107(52.2)
	February	103(50.2)
	March	97(47.3)
	April	86(42)
	May	74(36.1)
	June	86(42)
	July	82(40)
	August	75(36.6)
	September	78(38)
	October	68(33.2)
	November	82(40)
	December	88(42.9)

4.3 Preparation and consumption of ILV

Up to 78.7% of respondents consume ILV at least once a week, and lunch and supper were the most meals in which most of the respondents eat ILV, while the leaves and fruits were indicated

as the plant parts of ILV crops consumed the most. Boiling, steaming, frying and stewing were the cooking methods used the most by respondents to cook ILV. The majority of respondents indicated that everyone in their household eats ILV and only a few respondents (31%) indicated they preserve indigenous vegetables in their households (Table 4.5). Respondents within the ethnicity sub-groups (black and coloured) differ significantly regarding whether they consume indigenous leafy vegetables or not, with blacks being the most consumers of ILV (Table 4.6). Among all the sociodemographic groups, only respondents within the age sub-groups differ significantly ($P \leq 0.05$) in their response regarding how often they consume ILV. More respondents above 36 years of age consumed ILV every day or at least twice a week compared to those below 36 years of age (Table 4.7). Compared to coloureds, blacks were more likely to consume ILV with an odd ratio of 29.715 and the model was significant at $p = 0.002$. The other sociodemographic factors could predict the likelihood of ILV consumption (Table 4.8).

Table 4.5 Preparation and eating of ILV by respondents (N=205)

Variables		Frequency
How often do you consume indigenous vegetables?	Everyday	19(10.1)
	At least 4 to 6 times a week	20(10.6)
	At least twice a week	57(30.3)
	At least once a week	51(27.1)
	At least once a month	40 (21.8)
During which meal(s) are indigenous vegetables mainly consumed?	Breakfast	38(18.5)
	Lunch	114(55.6)
	Supper	107(52.2)
	Leaves	129(62.9)
	Fruits	161(78.5)

Which part of the indigenous vegetable crop is mainly consumed?	Stem	8(3.9)
	Roots	18(8.8)
	All of above	1(0.5)
Which method of cooking do you use for cooking indigenous vegetables?	Boiling	134(65.4)
	Steaming	120(58.5)
	Frying	177(86.3)
	Stewing	196(95.6)
Does everyone in your household eat indigenous vegetables?	Yes	162(86.2)
	No	26(12.7)
Do you preserve indigenous vegetables in your household?	Yes	58(31)
	No	129(69)

Table 4.6: Demographic variables for which there was significant (p≤0.05) difference in the responses of respondents regarding whether they consumer or do not consume of ILV (N=205)

Demographic variables		**Response within ethnic groups regarding the consumption of ILV**		**¥p value**
		Yes (%)	No (%)	
Ethnicity	Black	175 (95.1%)	9 (4%)	
	Coloured	12(66.7)	6(33.3)	0.000

¥ = Chi-square tests

Table 4.7: Demographic variable for which there was significant (p≤0.05) difference in the responses of respondents regarding how often they consume indigenous vegetables of ILV (N=205)

Demographic variables		how often they consume indigenous vegetables				p value
		1Everyday	2Atleast twice a week	3Atleast once a week	4Atleast once a month	
Age groups	18 – 25 Years	0(0.0)	4(15.4)	11(42.3)	11(42.3)	**0.010**
	26 – 35 Years	7(7.5)	7(7.5)	30(32.3)	49(52.7)	
	36 – 45 Years	4(8.9)	6(13.3)	14(31.1)	21(46.7)	
	Above 45 Years	8(33.3)	3(12.5)	4(16.7)	9(37.5)	

¥ = Chi-square tests

Table 4.8: The Predicting effect of Ethnicity, employment type, average monthly income, and household size on the non-consumption of indigenous vegetable from binary logistic regression (0 = do not consume ILV, 1 = consume ILV

Variables in the Equation					
				95% C.I.for EXP(B)	
	B	Sig.	Exp(B)	Lower	Upper
Gender1(Male)	0.648	0.394	1.911	0.430	8.489
Age		0.224			
18 – 25 Years	-22.489	0.997	0.000	0.000	.
26 – 35 Years	-20.497	0.998	0.000	0.000	.
36 – 45 Years	-21.117	0.998	0.000	0.000	.
Ethnicity (Blacks)	3.392	**0.002**	29.715	3.611	244.528
Monthly income		0.097			
Below R1000	-0.097	0.926	0.908	0.117	7.047
R1000 – R2999	-1.703	0.112	0.182	0.022	1.490

Household size		0.515			
Live alone	0.138	0.913	1.148	0.097	13.540
2	-0.475	0.681	0.622	0.065	5.957
3	1.309	0.307	3.701	0.301	45.474
4	0.838	0.564	2.312	0.134	39.915
5	-0.645	0.604	0.525	0.046	6.018
Constant	20.594	0.998	87898015		
			6.321		

a. Variable(s) entered on step 1: Gender1, Agegroup2, Ethnicity3, Monthlyincome6, HHsize11.

CHAPTER 5: DISCUSSION

5.1 Socio-demographics

The majority of the respondents were female and this could be because more than 51% of the South African population comprises of females based on figures obtained in the last census (STASSA 2018). The low proportion of male respondents in this study may also be due to the migration of some males from rural areas to urban or farming areas to search for jobs and better opportunities in life (Mlambo, 2018; Modirwa & Oladele, 2012; Western Cape Census 2011). Women are often left behind to attend to household activities and the collection and cooking of foods for the family (Mayekiso, 2012). Most of the respondents were blacks and this could be attributed to the fact that ILV form an integral part of most indigenous African communities (van Rensburg et al., 2013).

Most of the respondents were not married and this can be attributed to the high cost of bride price, which is often required to conclude marriages in African communities. Individuals are not considered married if the bride price has not been paid (Rudwick and Posel, 2015). The reason why most of the respondents were unemployed could be attributed to the high unemployment rate (26.7%) in South Africa as a whole (STATSSA, 2018). Another contributing factor is youth unemployment due to the low education levels in rural settlements. Individuals in rural settlements often have lower levels of education compared to their urban counterparts, hence the lack of skills required for employment (Rena, 2014). The access to social grants from the government provides a source of monthly income and could discourage the youth from venturing into income generating activities such as farming (Kepe & Tessaro, 2014).

Very little job opportunities are available in rural and informal settlements because of the low labour demand in rural areas. Rural areas are characterized by the poor development of

infrastructure and service provision leading to little creation of job opportunities in these areas (Mlambo, 2018). The agriculture industry in the WCDM offers seasonal job opportunities during the farming season; however current drought conditions further reduce job opportunities as farming activities decline (Botai et al., 2017). In addition, informal settlements act as receiving settlements that accommodate a large number of migrants seeking an entry point into the labour market (HDA, 2013). The jobs available may not be sufficient considering the influx of migrants into the informal settlements (WCDM Social Economic Profile, 2016).

The vast majority of respondents had an average monthly income of below R1000 and this could be attributed to low-paid unskilled jobs in rural and informal settlements. In the KZN province Kings Rest informal settlement, available jobs included collecting and selling scrap metal and cardboard, gardening and chicken rearing, domestic work, and casual factory work. Residents reported receiving R50 to R80 a day for scrap collection and R50 to R100 a day for domestic work (Hunter & Possel, 2012). On the other hand, village projects such as communal gardens, leasing of farmlands and stokvels were some of the activities done to generate income (Bannister, 2003). In the North West Province rural settlement, a monthly income of between R601 to R800 was reported (van der Hoevan et al., 2013).

Regarding levels of education, the majority of respondents (76.1%) had no formal education while only 20% had a matric qualification. The reason for this low education level can be attributed to racial-segregation laws from the apartheid government which limited access to educational institutions for black South Africans by relocating them into overcrowded reserves away from white-dominated urban areas (Valente, 2009). Findings from previous research confirm that rural areas in KZN, Limpopo, Western Cape and North West Provinces were found to be having low levels of education (Rena, 2014; van der Hoevan, 2013; Oladele & Modirwa, 2012; Faber et al., 2010). Although the post-apartheid police address racial constraints to education access, poverty in the rural areas remains a contributing factor to low

education levels among the black South Africans. A lack of finances to afford required necessities for schooling, such as transport and uniforms, is also a hindrance (Wilkinson et al., 2017; Timaeus et al., 2013). On a separate note, teenage pregnancy is seen as a factor placing limits on a learner's completion and achievement of education in South Africa. Young mothers could experience problems relating to pregnancy-related illnesses as well as emotional stress, leading to a failure to cope with studies (Modisatsile, 2012).

5.2 Residential details of respondents

The majority of respondents were from households that were located in informal settlements. This is mainly because of the increase in informal dwellings over traditional dwellings in the Saldanha Bay, Martzikana and Cederburg municipalities (WCDM, 2014). The vast majority of the households of respondents had more than three people and this is in line with the Western Cape Province average household size of 3.6 (STATS SA Community Survey, 2016). In rural and informal settlements, large households are often associated with poverty and higher chances of food insecurity (Sekhamphu, 2013; Altman et al., 2009). ILV can play a significant role in curbing food insecurity in large households in rural communities considering that less monetary input is required for their cultivation compared to exotic vegetable crops (Muvengahama et al., 2013; Dweba & Mearns, 2011; Vorster et al., 2007).

5.3 Access to and consumption of ILV

The ILV that were accessible to 50% or more of respondents were sweet potatoes, melon and pumpkin. This could be due to favourable climatic conditions that favour the growth of these ILV (ARC, 2011). Furthermore, WC soils favour the cultivation of sweet potato and cucurbits as the soils are loamy, with good drainage that prevents rotting of crop fruits (ARC, 2011; DAFF, 2006). These crops are also considered drought resistant owing to their ability to adapt to changes in the environmental conditions (van Resnburg, 2007). Sweet potato has a prolific

root system, enabling the crop to extract water from shallow soils; also, being a C3 plant, the crop has the ability to adapt photosynthetic cells to adapt to changes in the environmental conditions (Motsa et al., 2015). The planting seeds can be obtained from the matured fruits of pumpkin and melons, and these crops can be intercropped with maize or other taller varieties, whilst sweet potato tubers are also left in the ground and harvested when needed or left to restart the growing cycle (Motsa et al., 2015; van Rensurg et al., 2012). Although the young tender leaves and stems are harvested as soon as the plants are established, the fruits are left to mature and improve eating properties and can be stored as food reserves and consumed when required; similarly the sweet potato tubers are also stored and consumed when required (Motsa et al., 2015; van Rensurg et al., 2012).

Other ILV accessed by more than 25% but less than 50% of respondents were Cow peas, Common sow thistle, Pegion peas, Common labsquarter, Amaranth, Chinese cabbage and Ethiopian mustard. The access to these ILV could be affected by their seasonal availability where fresh ILV are more available in their growing season and scarce during the non-growing winter seasons (Shumsky et al., 2014; Mojeremane et al., 2011). In the North West Province, research shows that ILV such as amaranth are available soon after the rains (van de Hoevan, 2013) and in KZN and Limpopo Province ILV were available during the summer months (Faber et al., 2010). In addition, previous research shows that access to markets can negatively affect the consumption of ILV as it provides easy access to ILV such as pumpkin, sweet potato and melons over the ILV that have to be harvested from the wild (Vorster et al., 2007).

The least consumed ILV accessed by 20% or less of the consumers were Jews mallow, Spiderplant, Cassava, Purslane and Nightshade. This could be due to the undesirable attributes such as the slimy texture of the jews mallow, which could be offensive to others, and the bitter taste of the spiderplant and nightshade, which could also be undesirable (van Rensburg, 2014; van der Hoevan, 2013). Only a minority of the respondents did not consume ILV and the reason

put forward by the majority of them was that they did not like the taste of these ILV. The undesirable bitter taste associated with some ILV can negatively influence the palatability and hence consumption (van der Hoevan, 2013). Additional ingredients such as herbs, spices, carrots or cabbage and other cooking methods can be used to render ILV dishes more palatable and attractive (Maanda & Bhat, 2010; van der Hoevan, 2013; van Resnburg et al., 2014; Pitso & Lebese, 2014). The addition of peanut flour or peanut butter to ILV during cooking has been found to improve the palatability and texture, while the addition of bicarbonate of soda reduces the sliminess of mucilaginous ILV such as okra (Matenge et al., 2011). The parboiling, squeezing and discarding of the water use for boiling can be used to reduce the bitterness and improve the texture of bitter ILV such as spiderplant (van de Hoevan, 2013; Dweba & Mearns, 2011). This cooking method results in nutritional losses as water soluble ascorbic acid and flavonoids leaching into the water are discarded as well (Uusiku et al., 2010).

On the other hand, the vast majority of respondents indicated they consumed ILV because ILV are healthy. These findings are in line with previous studies where respondents had a strong belief that ILV have a better capacity to maintain good health (Hart, 2011; Guyu & Maluneh, 2015; Taruvinga & Nengovhela, 2015). ILV have macronutrients, micronutrients, anti-oxidant, anti-bacterial and immune boosting properties, thus ILV do not only serve as food sources but also as medicinal sources (Njume et al., 2014; Uusiku et al., 2010; Dweba & Mearns, 2011).

The reason why the majority of respondents indicated that the availability of indigenous vegetables has increased in their area could be attributed to the adaptation of these vegetables to arid weather conditions (Botai et al., 2017). These harsh weather conditions would favour the growth of ILV unlike their exotic counterparts (Hart, 2011; Pitso & Lebese, 2014; Mayekiso & Mditshwa, 2017). The adaptation of ILV to arid conditions enables them to be available throughout each month of the year and some of them, such as amaranths, do not require a specific season for cultivation (Pitso & Lebese, 2014). Access to ILV could be

available for respondents working on farms as they would pick them up during their working time. Moreover, research shows that some large-scale farmers have agreements with small-scale ILV vendors that they collect ILV for free as this assists them to keep the plantations weed free (van der Hoevan ,2013; Shackleton et al., 2009).

A significant minority of respondents also indicated that the availability of ILV has decreased in their area and this can be attributed to a lack of their cultivation as well as the introduction of exotic food crops. The practice of harvesting ILV without cultivation does not support a reliable availability of ILV as there is no replenishment and maintenance of existing ILV species (Mavengahama et al., 2013). Lack of cultivation consequently leads to the unavailability of ILV, insufficient quantities for households as well as the possible extinction of ILV species. Exotic food crops are cultivated as cash crops for income generation, whilst the ILV growing amongst them are considered weeds and eliminated in the fields/plantations by chemical spraying (van der Hoevan et al., 2013; Mavengahama et al., 2013). The high utilisation of exotic vegetable food crops compared to ILV food can be attributed to their availability, prestige and market value (Bvenura & Afolayan, 2015; Dweba & Mearns, 2011; Hart, 2011). Chemical spraying favours the growth of exotic species as it kills and suppresses the growth of ILV, consequently leading to a reduced availability of ILV. Promoting the cultivation of ILV and educating farmers on their significance could prevent the extinction of ILV species.

The majority of respondents who consumed ILV indicated they obtained them mostly from the informal markets and retail shops. This finding is consistent with other research suggesting that ILV were found in informal markets in rural areas (Matenge et al., 2011. The findings from other Southern African countries such as Malawi and Mozambique portrayed non-structural informal markets (street vendors and markets) as the major selling outlets for ILV (Chogomaka et al., 2015).

The commercialisation of ILV can promote cultivation, boost image, boost demand and contribute to income generation for many households in rural communities and informal settlements (Pitso & Lebese, 2014; Shrestha, 2013). Community education on the production and utilization of ILV through campaigns activities such as radio talks, pamphlets, cooking demonstrations and exhibitions may be used to increase consumer awareness on ILV (Muhanji et al., 2015). Training on agricultural techniques, such as the use of correct land-preparation techniques, vegetable husbandry, soil-fertility management and farm-management practices can be provided to ILV farmers to ensure an all-year-round supply of ILV to the markets (Muhanji et al., 2015; Drimie & Mclachlan, 2013).

5.4 Preparation and consumption of ILV

The majority of the respondents consumed ILV at least once a week and this is because the consumption of ILV is associated with communities experiencing poverty, a low income and unemployment (van der Hoeven et al., 2013; Hart, 2011). A study conducted in KwaZulu-Natal and the North West Province in South Africa showed that the consumption of ILV is associated with poverty, low-income levels and unemployment (Faber et al., 2010). Lunch and supper were the meals in which most of the respondents eat ILV and the reason for this is that ILV are eaten as an accompaniment to the main meal of the day. They often served as relish to accompany the starchy meals (Hart, 2011; Mavengahama, 2013). This is in line with previous findings indicating that ILV were mostly eaten during midday and evening meals (Faber et al., 2010; Hart, 2011).

Leaves and fruits were the most consumed parts of ILV; this result concurs with the research (Dweba & Mearns, 2013; Berihun & Molla, 2017). The reason could be because leaves are the most abundant part of the ILV plant. Young tender leaves are harvested once the plant is established and new shoots continue to develop, enabling repeated harvests in the plant cycle.

The fruits such as pumpkins and melons are consumed most owing to their long storage period, which increases their availability in markets and retailers throughout the year (van Rensburg et al., 2012).

Boiling, steaming, frying and stewing were the cooking methods used the most by respondents to cook ILV and these cooking methods enables the development of extra flavours in meals. Furthermore, additional ingredients such onion, curry and soup powder improved the flavour and palatability of dishes (Faber et al., 2010; Shackleton et al., 2009). Boiling and steaming are also used to extracting the bitter taste of ILV such as spiderplant (van der Hoevan, 2013) and to improve the texture of "harder plants" such as blackjack which can be boiled for about an hour (Faber et al., 2010). Amaranth leaves are usually steamed in a little water to attain the soft texture and maintain the green colour (Pitso & Lebese, 2014).

The majority of respondents indicated that everyone in their household eats ILV. The advantage of this in terms of food security and dietary diversity are that poor households can rely on ILV to ensure household-food security, considering they are freely available in the wild (van der Hoevan, 2013; Mojeremane et al., 2011). Consumption of a variety of ILV ensures dietary diversity and prevents a monotonous diet. In addition, an increase in the diversity of ILV consumed ensures a nutritional benefit as different nutritional elements can be supplied (Mavengahama et al., 2013). Furthermore, food security is guaranteed, even in drought periods as well as seasonal availability of ILV (Shumsky et al., 2014).

Only a few respondents (31%) indicate they preserve indigenous vegetables in their households. This is not good because preservation ensures the availability of ILV year round, especially during hunger periods of droughts (Taleni et al., 2012; Hart, 2011). This finding is in agreement with a previous study in South Africa suggesting that there is a lack of knowledge

regarding the drying of ILV, and also the fresh form of ILV, is the most preferred in many communities (Bvenura & Afolayan, 2015; Dweba & Mearns, 2011).

Only respondents within the age sub-groups differ significantly ($P \leq 0.05$) in their response regarding how often they consume. Young people generally have limited knowledge of ILV and they possesses negative attitudes towards these vegetables as they regard them as not fashionable or trendy (Muhani et al., 2015; Dweba & Mearns, 2011) and this explains why most respondents above 36 years of age consumed ILV every day or at least twice a week, compared to those below 36 in this community. Only ethnicity could predict the consumption of ILV significantly, in which blacks were found to be more likely to consume indigenous leafy compared to the coloureds and whites. The reason for this is that ILV consumption constitutes part of indigenous knowledge systems in many rural African communities; hence most blacks are aware of the consumption and nutritional benefits associated with ILV over many generations (Gido et al., 2017).

CHAPTER 6: CONCLUSIONS AND RECOMMENDATIONS

6.1. Conclusions

The study investigates the access and consumption of indigenous leafy vegetables by rural and informal settlement communities in the West Coast District Municipality. The findings from the study indicate that ILV are popular in the WCDM, and are consumed at least once a week by most members of the household, mainly for their taste and health benefits. Most of the respondents consuming ILV were unemployed, young black females with no formal qualification and earned an average monthly income of less than R1000, and with a household size of more than three people. Factors such as employment status, higher household size and higher income levels did not influence the frequency of ILV consumption; however respondents over 36 were most likely to consume ILV at least twice week compared to respondents below the age of 36. The most accessed ILV to respondents were sweet potato, pumpkin, and melon, and the least accessed were cocoyam, purslane, blackjack, spiderplant and jews mallow. A variety of cooking methods, that is boiling, steaming, frying and stewing, was used depending on the type of ILV and it was a common practice to add additional ingredients during cooking. The practice of preserving ILV was uncommon as most respondents hardly preserved ILV. Indigenous leafy vegetables were predominantly obtained from the informal sector. Other sources of ILV include home gardens/yard, community gardens/fields and veld. Although cultivation has the potential to increase access to and the availability of ILV and generate income through trading, it is still very limited in the WCDM.

6.2. Recommendations

Considering the high unemployment among the youth, projects such as ILV communal gardens could potentially create employment opportunities generating income as well as contribute to the dietary diversity of households in these communities. Governmental bodies and NGO should engage the youth in the awareness of the commercial benefits of ILV and offer practical training on cultivation of ILV. The government should also provide more land for communal ILV gardens as well as funds to support these gardens. Further research should be on establishing formal cultivation procedures for ILV to ensure sustainable supply into the markets, creating new recipes and improving existing recipes to ensure optimum nutrition availability and improving dietary diversity. Recipe development research should include recipes that can be commercialized and produced in food manufacturing sector for retail supply. Furthermore the inclusion of ILV in existing commercial products can ensure an entry point into the retail markets.

6.3. Limitations of the study

The estimated number of households in the WCDM is 78 489 (West Coast District Municipality, 2014). The research sample size was 205 respondents representing 205 households; this may be a smaller sample size to make conclusions for the whole district; however the findings should give a good insight into the subject, since there is limited information on the subject in the West Coast District, Western Cape.

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APPENDIX 1: QUESTIONNAIRES

QUESTIONNAIRE:

THE CONTRIBUTION OF INDIGENOUS VEGETABLES TO FOOD ACCESS AND INCOME GENERATION OF HOUSEHOLDS IN THE RURAL AND INFORMAL SETTLEMENTS IN THE WEST COAST MUNICIPALITY.

PARTICIPANT CODE: _____

INTERVIEW DATE: _____

INSTRUCTIONS

1. **Use a tick (√) to mark suitable response.**
2. **Complete neatly, do not cancel.**
3. **If unsure, please ask for assistance**
4. **Once completed kindly return paper to interviewer.**

SECTION A – Biographic and Settlement Information

Tick (√) the one that applies to you.

1. Gender

1	Male	
2	Female	

2. Age group

1	18-25 years	

2	25-35 years	
3	36-45 years	
4	46-55 years	
5	56-65 years	
6	66-75 years	

3. Ethnicity

1	Black	
2	White	
3	Coloured	
4	Indian	
5	Asian	

4. Marital Status

1	Married by law	
2	Traditional marriage	
3	Living together	
4	Separated	
5	Widowed	
6	Single	

5. Which of the following is your household source(s) of income? (Tick any that applies)

1	Pensioner	
2	Formal employment	
3	Self-employment	
4	Farming	
5	Casual labour	
6	Unemployed	

7	Other	

Other, specify_____

6. How would you describe your monthly average income?

1	Below 1000	
2	R1000-R2999	
3	R3000-R4999	
4	R5000-R6999	
5	R7000-R8999	
6	R9000-R15000	
7	Above R15000	

7. Which of the following best describes your highest education level?

1	No formal education	
2	Matric certificate	
3	Certificates or diploma	
4	Higher diploma	
5	University degree	

8. In which one of the following local municipality do you live in now?

1	Saldanha Bay	
2	Bergrivier	
3	Swartland	
4	Matzikama	
5	Cederberg	

9. In which one of the following settlements is your household located?

1	Rural settlement	
2	Informal settlement	

10. How long have you lived in this area?

1	Less than a year	
2	One year	
3	More than one year	
4	More than three years	

11. Size of your household, i.e. the number of people including yourself, who live in your house/ dwelling for at least three months of the year?

1	Live alone	
2	2	
3	3	
4	4	
5	5	
6	6	
7	More than 6	

12. What is the number of adults or children in your household?

	Members	**Numbers**	
1	Female adults		
2	Male adults		
3	Number of children		

13. Who is the head of the household?

1	Father	
2	Mother	
3	Grandfather	
4	Grandmother	
5	Uncle	
6	Aunt	
7	Other	

Other, specify _____

SECTION B – Information on availability and access to indigenous vegetables (*imifino, morogo, inheense groente*) by communities

Tick (√) the one that applies to you.

14. Tick the indigenous vegetables (*imifino, morogo, inheense groente*) available in your area.

1	**Amaranth** (Misbredie, *varkbossie, imbuya, imifino umtyuthu, unomdlomboya, hanekam, isheke, thepe)*	
2	Chinese cabbage (Sjinese kool, rape, Chinese mustard seed, isiqwashumde)	
3	Cow pea (*akkerboentjie, koertjie, iimbotyi,indumba)*	
4	Pumpkin (*pampenblare, cetshana, ibobola, intanga)*	
5	Melons (bitterwaatlemonenblare, intabontyi, ikabe, ujodo, umxoxozi)	
6	Blackjack*(uqadolo, monyane, umhlabangubo, gewone, knapsekerel, makolongane)*	
7	Spiderplant (*vinerblaartee, ulude, banhala, lerotho, cat whiskers, palmbossie, amazonde)*	
8	Jews mallow (*vilde jute,wild jute, thelele, delele, gushe, ligusha, okra)*	
9	Nighshade (*galbessie/nagskade, umsobo – sobo, umsoba)*	
10	Sweet potato *(patat, ubhatata, izambane eliswiti)*	

11	Common labsquarter *(imbikicane, isijabane, goosefoot*)	
12	Common sow thistle *(ihlaba, irhaba, xabexabe)*	
13	Ethiopian mustard Ethiopian kale	
14	Cassava (tapioca)	
15	Cocoyam *(amadumbe, amadombie, amadumbi)*	
16	Purslane, *(igwanitsha, amalengane)*	
17	Pegion peas *(ndozi, duif- ertjie, udali)*	
18	I do not know them	
19	Other	

Other, specify _____

15. Do you eat indigenous vegetables (*imifino, morogo, inheense groente*)?

1	Yes	
2	No	

16. If no, why?

1	I do not like them	
2	They are not available in my neighbourhood	
3	I do not know how to cook them	
4	I do not know what they are	
5	Other	

Other: Specify_____
_____

If you answered no to question 15, please answer question 16 only. If you answered yes to question 15, please skip question 16 and continue from question 17.

Thank you for your co-operation in completing this questionnaire. Kindly return the questionnaire as specified in the cover letter.

The following questions pertain to people who eat indigenous leafy vegetables.

17. Why do you eat indigenous vegetables (*imifino, morogo, inheense groente*)? You can tick more than one box.

1	I like the taste	
2	They are cheap	
3	They have many health benefits	
4	They are easily available	
5	Other	

Other: Specify_____
_____

18. Has the availability of indigenous vegetables *(imifino, morogo, inheense groente)* in your area decreased or increased?

1	Increased	
2	Decreased	

19. Why do you think so?

_____

_____

20. Where do you get indigenous vegetables *(imifino, morogo, inheense groente)*?

1	Buy from informal market	
2	Buy from retail shop	
3	From the home garden / yard	

4	From the community garden	
5	From planting fields/plantations	
6	From the wild	

21. In what form do you mainly get indigenous vegetables *(imifino, morogo, inheense groente)*?

1	Fresh	
2	Dried	
3	Frozen	

22. In which months do you get **fresh** indigenous vegetables *(imifino, morogo, inheense groente)?*

1	January	
2	February	
3	March	
4	April	
5	May	
6	June	
7	July	
8	August	
9	September	
10	October	
11	November	
12	December	

23. In which months you get **dried** indigenous vegetables *(imifino, morogo, inheense groente)?*

1	January	

2	February	
3	March	
4	April	
5	May	
6	June	
7	July	
8	August	
9	September	
10	October	
11	November	
12	December	

SECTION C – Information on mode of preparation, consumption and preservation of indigenous vegetables (*imifino, morogo, inheense groente*). Tick (√) the one that applies to you

24. How often do you eat indigenous vegetables (*imifino, morogo, inheense groente)*?

1	Every day	
2	At least 4 - 6 times a week	
3	At least twice a week	
4	At least once a week	
4	At least once a month	

25. During which meal(s) are indigenous vegetables (*imifino, morogo, inheense groente*) mainly consumed?

1	Breakfast	
2	Lunch	
3	Supper	

26. Which part of the indigenous vegetables (*imifino, morogo, inheense groente*) plant is mainly consumed? Give an example of the indigenous vegetable.

1	Leaves e.g.	
2	Fruits e.g.	
3	Stem e.g.	
4	Root e.g.	
5	All of the above	

27. Which method of cooking do you use for cooking indigenous vegetables (*imifino, morogo, inheense groente*)? Give an example of the indigenous vegetable.

1		Boiling e.g.	
2		Steaming e.g.	
3		Frying e.g.	
4.		Stewing e.g.	

28. Do you add additional ingredients during cooking of indigenous vegetables (*imifino, morogo, inheense groente*)?

1	Yes	
2	No	

If yes please specify _____

29. Does everyone in your household eat indigenous vegetables *(imifino, morogo, inheense groente)*?

1	Yes	
2	No	

30(a) which age group **<u>does not eat</u>** indigenous vegetables *(imifino, morogo, inheense groente)?*

1	17 and below	
2	18-25 years	
3	25-35 years	
4	36-45 years	
5	46-55 years	
6	56 and above	

30(b) which gender **<u>does not eat</u>** indigenous vegetables (*imifino, morogo, inheense groente*)?

1	Male	
2	Female	
3	Both male and female	

31. Do you preserve indigenous vegetables *(imifino, morogo, inheense groente*) for storage and future use?

1	Yes	
2	No	

If you answered yes to question 31, please skip 32 and go to 33

32. If no, why not?

1	I do not know have the necessary equipment to preserve indigenous vegetables,(*imifino, morogo, inheense groente*)	
2	I do not have enough to eat and preserve	
3	I do not know how to preserve indigenous vegetables (*imifino, morogo, inheense groente*)	
4	Preserved indigenous vegetables *(imifino, morogo, inheense groente*) are less nutritious	
5	Preserved indigenous vegetables (*imifino, morogo, inheense groente*) do not taste nice	
6	Other	

Other, specify _____

33. If yes, briefly explain the method of preservation used.

_____

_____

34. How long do you store preserved indigenous vegetables (imifino, morogo, inheense groente)?

1	Less than 3 months	
2	Between 3 to 6 months	
3	One year	
4	More than one year	

SECTION C – Information on the cultivation and the contribution of indigenous vegetables (*imifino, morogo, inheense groente*) to household income. Tick (√) the one that applies to you.

Which of the following do you have?

1	Home garden	
2	Community field	
3	Plantation	

35. Do you grow any crops in your home garden or fields?

1	Yes	
2	No	

If you answered no to question 35, do not proceed. If you answered yes to question 35, continue to question 36.

Thank you for your co-operation in completing this questionnaire. Kindly return the questionnaire as specified in the cover letter.

36. Do you grow any indigenous vegetables (*imifino, morogo, inheense groente*) in your home garden or fields?

1	Yes	
2	No	

If you answered no to question 36, please answer question 37 only. If you answered yes to question 36, please skip question 37 and continue from question 38.

37. If no, why not?

1	I do not have seeds	
2	I do not know how to cultivate them	
3	Other	

Other, Specify _____

Thank you for your co-operation in completing this questionnaire. Kindly return the questionnaire as specified in the cover letter.

38. If yes, which indigenous vegetables (*imifino, morogo, inheense groente*) do you cultivate?

_____

_____

39. What is the size of your cultivation area?

1	Home garden	
2	Community field	
3	Plantation	

40. Where do you obtain seeds and/or seedlings for planting indigenous vegetables *(imifino, morogo, inheense groente)?*

1	Self-collection	

2	Get from neighbours	
3	Get from a specific person in the community	
4	Purchase seeds	

41. How do you cultivate your land?

1	Tractor	
2	Animals (oxen, donkeys, mules)	
3	Hand	
4	Other	

If other, specify _____

42. Do you apply any manure to indigenous vegetables (*imifino, morogo, inheense groente*)?

1	Yes	
2	No	

43. If yes, which manure do you use

1	Compost	
2	Animal (cattle, goat, chicken)	
3	Fertilisers	
4	Other	

If other, specify

_____

44. What do you use for pest control?

1	Natural products	

2	Chemicals	
3	None	

45. Do you cultivate indigenous vegetables (*imifino, morogo, inheense groente*) for sale?

1	Yes	
2	No	

If yes, list the indigenous vegetables *(imifino, morogo, inheense groente*) cultivated for sale

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If you answered no to question 45 do not proceed. If you answered yes to question 45, continue from question 46.

Thank you for your co-operation in completing this questionnaire. Kindly return the questionnaire as specified in the cover letter.

46. How do you pack a unit for sale?

1	Plastic bag	
2	Bunches	
3	Customer brings own container	

47. Where do you sell indigenous vegetables (*imifino, morogo, inheense groente*)?

1	Door to door	
2	At home	
3	Market	
4	Gathering area? be specific	
5	Sell to a retail shop	

48. Do you sell all packed indigenous vegetables (*imifino, morogo, inheense groente*) per day?

1	Yes	
2	No	

49. In your opinion, indicate the contribution of money obtained from selling indigenous vegetables (*imifino, morogo, inheense groente*) to household income. Tick the appropriate box.

1	It does not contribute a lot of money	
2	It contributes some money	
3	It contributes a lot of money	

50. Approximately how much profit do you make from selling indigenous vegetables (*imifino, morogo, inheense groente*) per month/week/day? (be specific)

1	Less than R500	
2	Between R600 – R1000	
3	Between R1001 – R2000	
4	Between R2001 – R3000	
5	R5000 or more	

Thank you for your co-operation in completing this questionnaire. Kindly return the questionnaire as specified in the cover letter.

APPENDIX 2: CONSENT FORM

THE CONTRIBUTION OF INDIGENOUS VEGETABLES TO FOOD ACCESS AND INCOME GENERATION OF HOUSEHOLDS IN THE RURAL AND INFORMAL SETTLEMENTS IN WEST COAST DISTRICT MUNICIPALITY, WESTERN CAPE PROVINCE, SOUTH AFRICA.

Dear Mr/Mrs/Miss/ Date……/……/20……

Nature and Purpose of the study

The aim of the study is to investigate the contribution of indigenous vegetables to food access and income generation of households in the rural and informal settlements in West Coast district Municipality, Western Cape Province, South Africa.

Research process

The researcher will interview both men and women between the ages of 18 and 75+ years in rural and urban areas. Questionnaires will be given to participants and they will be asked a series of questions relating to the availability and access of indigenous leafy vegetables, their consumption, cooking, preservation and economic activities. Your demographic information such as age, racial group, monthly salary and level of education will be recorded.

Notification that tape recordings will be required

Tape recording may be used when deemed necessary by the researcher.

Confidentiality

Your ratings and assessments of any of the research instruments as well as your opinions are viewed as strictly confidential, and only members of the research team will have access to the information. No data published in dissertations and journals will contain any information by means of which you may be identified. Your anonymity is therefore ensured.

Withdrawal clause

I understand that I may withdraw from the study at any time. I therefore participate voluntarily until such time as I request otherwise.

Potential benefits of the study

Information from this study will be used by different stakeholders to improve on the utilisation of indigenous vegetable by households in rural and informal settlements. It will benefit communities with knowledge on the unexploited roles of indigenous vegetables in food security, alleviating malnutrition and income generation.

Further Information

If there is any question concerning this study contact Dr Frederick Tabit, 0114712080, Department of Life and Consumer Sciences, UNISA.

Consent

I, the undersigned, (full name) have read the information relating to the project and have also heard the verbal version, and declare that I understand it. I have been afforded the opportunity to discuss relevant aspects with the project leader, and hereby declare that I agree voluntarily to participate in the project.

I indemnify the university and any employee or student of the university against any liability that may incur during the course of the project.

I further undertake to make no claim against the university in respect of damages to my person of reputation that may be incurred as a result of the project/trial or through the fault of other participants, unless resulting from negligence on the part of the university, its employees or students.

I have received and signed copy of this consent form.

Signature of participant……

Signed at……on……

WITNESSES

1
……

2
……

APPENDIX 3: PROPOSAL APPROVAL LETTER

UNISA university of south africa

2016-02-29

Ref. Nr.: 2015/DLCS/003

To :
Ms B Ndhlovu
Student nr: 57642141
Department of Life and Consumer Sciences,
College of Agriculture and Environmental Sciences
Unisa

Cc: Dr F Tabit (tabitf@unisa.ac.za)
Supervisor

Dear Ms Ndhlovu

Request for approval of the Masters in Consumer Sciences research proposal submitted:

The contribution of indigenous vegetables to food access and income generation of households in rural and informal settlements in West Coast district municipality, Western Cape Province, South Africa

The research proposal "**The contribution of indigenous vegetables to food access and income generation of households in rural and informal settlements in West Coast district municipality, Western Cape Province, South Africa**" was reviewed by two independent reviewers. The proposal has been approved (66%). The approval of the research proposal allows you to continue and register for the dissertation phase of your Masters in Consumer Sciences in 2016.

You are hereby requested to complete the necessary CAES Ethics application forms and submit the electronic application to the Post Graduate Officer, Ms Marthie Van Wyk at vwykm@unisa.ac.za for Ethics clearance.

Wishing you all the best with the research you are undertaking.

Kind regards,

Dr SL Lebelo
Chair: Departmental Research Committee
Department of Life and Consumer Sciences
Unisa

Open Rubric

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa
Telephone: +27 12 429 3111 Facsimile: +27 429 12 429 4150
www.unisa.ac.za

APPENDIX 4: ETHICS APPROVAL FROM UNISA

UNISA university of south africa

CAES RESEARCH ETHICS REVIEW COMMITTEE

Date: 07/04/2016

Ref #: **2016/CAES/057**
Name of applicant: **Ms B Ndhlovu**
Student #: **57642141**

Dear Ms Ndhlovu,

Decision: Ethics Approval

Proposal: The contribution of indigenous vegetables to food access and income generation of households in the rural and informal settlements in West Coast district municipality, Western Cape Province, South Africa

Supervisor: Dr F Tabit

Qualification: Postgraduate degree

Thank you for the application for research ethics clearance by the CAES Research Ethics Review Committee for the above mentioned research. Final approval is granted for the duration of the project.

The application was reviewed in compliance with the Unisa Policy on Research Ethics by the CAES Research Ethics Review Committee on 06 April 2016.

The proposed research may now commence with the proviso that:

1) *The researcher/s will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.*
2) *Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study, as well as changes in the methodology, should be communicated in writing to the CAES Research Ethics Review Committee. An amended application could be requested if there are substantial changes from the existing proposal, especially if those changes affect any of the study-related risks for the research participants.*
3) *The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study.*

Note:
The reference number [top right corner of this communiqué] should be clearly indicated on all forms of communication [e.g. Webmail, E-mail messages, letters] with the intended research participants, as well as with the CAES RERC.

Kind regards,

Signature
CAES RERC Chair: Prof EL Kempen

Signature
CAES Executive Dean: Prof MJ Linington

APPENDIX 5: PERMISSION TO CONDUCT RESEARCH

UNISA
Department of Life and Consumer Sciences
University of South Africa
Private Bag X6 Florida, 1710

Municipal Manager,

West Coast District Municipality.

Dear Mr Henry Prins

PERMISSION TO CONDUCT A RESEACH IN THE WEST COAST DISTRICT MUNICIPALITY

I am currently enrolled for a master's degree at the University of South Africa (UNISA) and I hereby ask for permission to conduct a research in your local municipality. The title of the research is '*The contribution of indigenous vegetables to food access and income generation of households in the rural and informal settlements in West Coast district municipality, Western Cape Province, South Africa*'.

The research study is expected to take approximately three months of data collection. Data collection procedures will only include questionnaires and interviews which will be administered by me and a research assistant. The participants will be members of selected households in the West Coast District Municipality who are 18 years and above.

The aim of the study is to investigate the contribution of indigenous vegetables to food access and income generation of households in the rural and informal settlements in West Coast district Municipality, Western Cape Province.

For more details on this project you can contact my supervisors Dr FT Tabit via Tel: 011471208 and email: tabitft@unisa.ac.za.

A copy of the research proposal will accompany this letter for your reference.

Your consideration in this regard will be greatly appreciated.

Yours faithfully,

B·Ndhlovu

BONGIWE NDHLOVU (Researcher)

DR FT TABIT (Supervisor)

APPENDIX 6: PERMISSION LETTER FROM THE WEST COAST DISTRICT MUNICIPALITY

Rig alle korrespondensie aan:
Address all correspondence to:

MUNISIPALE BESTUURDER /
MUNICIPAL MANAGER H.F Prins

Navrae / Enquiries: F Williams

Verw. Nr. / Ref. No.: 15/16/7/7

WESKUS DISTRIKSMUNISIPALITEIT
WEST COAST DISTRICT MUNICIPALITY

Posbus / P O Box 242
Langstraat 58 / 58 Long street
MOORREESBURG 7310

Telefoon / Phone: (022) 433-8400
Faks / Fax: 086 692 6113

E-pos Adres / E-mail Address:
westcoastdm@wcdm.co.za

18 March 2016

Dear Ms Ndhlovu

This letter serves as authorization for you to conduct the research project entitled

"The contribution of indigenous vegetables to food access and income generation of households in the rural and informal settlements in West Coast district municipality, Western Cape Province, South Africa " at the West Coast District Municipality.

Please note that I have informed all the B-Municipalities in our area for them to also be aware of the research that will be taking place in their municipal areas.

We wish you all the best.

Yours faithfully,

MUNICIPAL MANAGER

APPENDIX 7: INDIGENOUS LEAFY VEGETABLES IN THE WEST COAST DISTRICT MUNICIPALITY.

Home garden in Tshitshi informal settlement, Saldanha Bay Municipality

Community garden in Ilingelethu informal settlement – Swartland Municipality

Home garden in Abbotsdale rural settlement, Swartland Municipality